TRANSFUND NEW ZEALAND

Interim Procedures for the Safety Audit of Traffic Control at Roadwork Sites

Review and Audit Division
Report No. RA98/689S

Interim Procedures for the Safety Audit of Traffic Control at Roadwork Sites

February 1999

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PREFACE

This is a interim report.

The Land Transport Safety Authority analysed the reports of crashes at roadwork sites for the year 1996. Their report (unpublished) found that there were 213 crashes reported to the Police in that year. Of the 213 crashes, 6 resulted in fatalities, 15 resulted in serious injuries. The report states "*The accidents at roadwork sites are … more frequently fatal crashes and less frequently non-injuries that the average traffic accidents in New Zealand. In other words the severity is higher than the national average.*"

Transfund's Review and Audit Division undertakes safety audits of road controlling authorities' existing roads. During these audits, traffic control at roadwork sites has been identified as a specific deficiency. Also, there is ample anecdotal evidence that the traffic control at roadwork sites frequently does not meet best practice guidelines.

Under the Health and Safety in Employment Act, contractors are responsible for ensuring that roadwork sites are as safe as practical for both their employees and for the public who access the site. There are also obligations on the road controlling authorities and those involved with the supervision of contracts.

Jeff Kaye of Opus International Consultants Ltd, Christchurch prepared these interim procedures, with assistance from John Boyson of Orewa. They based the procedures on original work by David Parkes and Mike Gray of Capital Training, Wellington. Members of the audit teams mentioned in the introduction to the interim procedures also provided useful comment on the procedures as they developed.

The introduction to these interim procedures describes the background and their development. It lists the groups who might use the procedures. Comments from users are sought. You should send your comments to the addresses provided in the introduction.

While every effort has been made to ensure the accuracy of these procedures, they are made available strictly on the basis that anyone relying on them does so at his/her own risk without any liability to Transfund New Zealand.

P V Wright
Review and Audit Manager
25 February 1999

IMPORTANT NOTE FOR THE READER

Document Status

This document “Interim Procedures for the Safety Audit of Traffic Control at Roadwork Sites” has status of a guideline as defined in Transfund New Zealand’s “Standards and Guidelines” Manual.

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APPENDICES

INTERIM PROCEDURES FOR SAFETY AUDITS OF TRAFFIC CONTROL AT ROADWORKS SITES

1. INTRODUCTION

Safety Auditing of projects was introduced by Transit New Zealand (Transit) in 1993 and is continuing to be used to ensure safety aspects of projects are addressed in the best possible way. Procedures were developed for Stage 1 *Feasibility* to Stage 4 *Pre opening of roading improvement projects.* Safety audits of existing roads started in February 1995, with draft procedures being published by Transit in February 1996.

Following the formation of Transfund New Zealand (Transfund) the above procedures have been revised and published in December 1998 as final procedures for *Safety Audits of Existing Roads.*

In January 1997 a pilot safety audit of traffic control at roadworks sites was undertaken in the Wellington / Wairarapa area. This initial study was followed up, in March 1998, by two more safety audits of traffic control of roadworks sites – the Northern Canterbury area and the Auckland North area.

From experience gained during the above trials and with respect to the results of the audits (refer Transfunds Summary Report of Safety Audits of Traffic Control at Roadworks Sites – Report No. RA 98/699S), Transfund decided to develop these interim procedures.

The interim procedures can be used by:

- Transfund or The Land Transport Safety Authority (LTSA)
- Road Controlling Authorities (RCA's)
- Consultants
- Contractors – To audit their own performance

In all cases, users are encouraged to engage auditors who are independent and have suitable experience in the fields of safety auditing and the management of traffic control at roadworks sites.

These procedures are "interim" only. To assist with both the development of this process and to enable audit teams to monitor the acceptability of their recommendations, feedback is important. Comments on the content and format of these procedures, as well as the overall benefits of the process are encouraged. Ongoing experience, from a wider range of teams, will result in further modification and upgrading of these procedures.

Any suggestion for improvement will be gratefully received by:

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2. GLOSSARY OF ABBREVIATIONS AND TERMS

The following abbreviations and "terms" have been used in these procedures.

- ***Announced Audits*** This type of audit is usually commissioned by the client, and are undertaken with disclosure to the client of the following:

  - ➢ Timing of the audit
  - ➢ Probable route for audit inspections
  - ➢ Sites to be audited

  Entry and closing (exit) meeting are always held in conjunction with this type of audit. The client may also nominate his representative to be a member of the audit team.

Note:	**These procedures are written in terms of this type of audit (announced) being undertaken**

- ***CEO*** Chief Executive Officer
- ***Client*** The organisation who commissions the audit. The client could be Transfund, Transit, an RCA, the LTSA, a Contracting Company or other organisation with a concern regarding the level of safety on the road.
- ***Entry Meeting*** - Opening meeting before audit inspections
- ***Exit Meeting*** Closing meeting held after inspections

- ***HCH*** High Capacity Highways
- ***LTSA*** Land Transport Safety Authority
- ***RCA(s)*** Road Controlling Authority(s)
- ***SCF*** Site Condition Factor
- ***SHR*** Site Hazard Rating
- ***TMP(s)*** Traffic Management Plan(s)
- ***Transfund*** Transfund New Zealand
- ***Transit*** Transit New Zealand, the RCA for State Highways in New Zealand.

- ***Unannounced Audits*** This type of audit is normally commissioned by Transfund. They are normally undertaken without advising the RCA(s) of the timing for the audit. This type of audit is sometimes referred to as a "blind" audit. To undertake this type of audit, the following changes are made to the methodology described in these procedures:

  - ➢ Entry meeting with RCA(s) not held
  - ➢ Closing or exit meetings not held
  - ➢ Client's representative not part of audit team
  - ➢ Information relating to road hierarchy, traffic volumes and TMPs is not sourced until after the audit inspections.

3. OBJECTIVES AND OUTCOMES

The objectives of a safety audit of traffic control at roadworks sites are:

- To identify potential safety problems for road users and others.
- To reduce the current, high crash rates at roadworks sites (*three times the national average for all fatal crashes).
- To ensure that measures to eliminate or reduce the identified problems are considered fully by the Client and those involved in construction and/or maintenance and/or any other on road activities, which may affect the normal operating condition of the road.
- To seek consistency across the nation's total network and to influence policy weaknesses.

A safety audit will:

- Help minimise the risk and severity of crashes that may be attributed to the presence of temporary traffic control on all roads.
- Optimise whole-of-life maintenance and operation benefits for the road network.

**Refer LTSA report – Traffic Safety at Road Works in New Zealand – Sigthorsson – March 1998*

- Improve awareness of safe practices for all on road activities.
- Help Transfund determine the effectiveness of its resource allocation for the provision of a safe and efficient roading network.
- Identify, primarily from a road user's perspective, those issues and features that give misleading or confusing messages.

4. EXECUTIVE SUMMARY OF THE ROAD SAFETY AUDIT PROCESS

The road safety audit process includes three parts:

- Setting up the audit
- Audit procedures
- Audit reporting

This assumes that the audit is an "announced" type. The differences relating to "unannounced" audits are shown in bold italics at the end of each section.

Setting up the audit involves:

- Commissioning the audit
- Specifying the terms of reference
- Appointing the audit team
- Agreeing on a time frame
- Gathering background information
- Ensuring necessary equipment is available

For unannounced audits, the following additional tasks are required:

- ***Choosing the area, roads or sites to be audited***
- ***Client chooses and appoints team leader, and other team members***

Audit procedures consist of:

- Entry meeting – covering health and safety issues, background information, site (road) selection, audit and reporting programme. Client's senior staff should attend this meeting.

- Audit process – undertaking work site inspections, preparing draft notes and identifying key issues.

- Exit meeting – reporting back to client's senior staff on key issues.

For unannounced audits, the RCA and their representatives will not attend the entry and exit meetings and will not be members of the audit team.

Audit reporting involves the sending of a letter, immediately following the audit, to the Client's CEO summarising the findings. A draft report is sent to the Client's Asset Manager. After comment from the Asset Manager, a final report is sent to the Client's CEO.

A suggested timetable for the process is given in Appendix 5.

5. SETTING UP THE AUDIT

This section describes how an audit is initiated and set up. The differences with each individual audit may call for differences in how they are set up, but all should follow the principles in these guidelines, and there should be good reason for departing from what has come to be accepted as good practice. The steps in setting up an audit may be summarised thus:

1. Choose the RCA or the road network area to be audited – ***(unannounced audits only)***.

2. Choose the team composition: Team Leader, second, third and fourth team members – ***(unannounced audits only)***.

3. Commission the Audit.

4. Agree between the Client, the Team Leader, and other team members the time frame for the audit, i.e. set indicative dates for the audit field work.

5. Specify audit details: terms of reference, information to be supplied and logistical tasks.

6. Gather background information.

7. Ensure that the necessary equipment is available, to undertake the audits.

8. Ensure a health and safety plan, relating to the audit activities is available.

5.1 Implementing the Audit

Transfund follows a regular programme of safety audits. RCAs may initiate their own audits. Consultants and Contractors may also use the process to audit their own performance.

5.2 Choosing the Team Leader and Team Members

The Client chooses a Team Leader and may chose the other team members. The Client may nominate their own suitably qualified representative as an additional

team member. This team member could be a member of the LTSA or the NZ Police, Traffic Safety Division.

5.2.1 Composition

The ideal audit team, for a full two day audit, should have a minimum of four persons. For the outcome of the audit to be credible it is important that the Auditors (except the Client's representatives) not be involved in the management of the particular road network. For smaller, or spot site audits, the team may consist of two, suitably qualified members.

Full Audit Teams should comprise:

- Team Leader – (essential for all audits)
- Team Member 1 – (essential for all audits, where more than one site is to be inspected).
- Team Member 2 – (desirable for audits of more than one day duration)
- Representative from the RCA, LTSA or NZ Police – (desirable for Transfund sponsored audits)

5.2.2 Team Members' Tasks

The Team Leader's tasks are:

- Co-ordinate the Audit Programme.
- Lead team meetings.
- Ensure the necessary equipment and documentation is available.
- Ensure team members complete their tasks.
- Brief the team regarding their safety whilst undertaking the audit and ensure that all team members read and sign the *Health and Safety Checksheet* (Appendix 4) and that it is forwarded to the client. Include TMP if required.
- Give guidance in the selection of roads for inspection.
- Prepare the report.

Team Members' tasks are:

- Fulfil the auditing inspection roles.
- Assist with reaching team conclusions.
- Review the Team Leader's draft report.

The tasks of the RCA, LTSA or NZ Police representative are:

- Assist the team by providing data.
- Accompany the team on the inspections and take part in team meetings.
- Provide the team with local knowledge of practices, policies and constraints.
- This representative should **not** drive for any of the inspections.

5.2.3 Skills and Qualifications

The ***Team Leader*** shall have the following skills and qualifications:

- Shall be an experienced road safety auditor, with a sound knowledge of crash studies.
- Shall have at least three years experience in the management of traffic control at roadworks sites. Such experience shall include the production or "approval" of "contractors" traffic management plans.
- Shall have attended, within the last two years, a "Certified" traffic control training course, or be a "certified" traffic control training course presenter.
- Shall have experience and training for the type of temporary traffic control being audited. For example an auditor must have experience and training (TNZ Certified HCH Training) to conduct audits of high capacity highways (HCH) such as motorways and high speed, high volume expressways and rural state highways. For all other roads the auditor must have experience and training to TNZ Certified Working on the Road (including TNZ G/1) Standard.
- Shall generally have been involved with a minimum of two previous safety audits of traffic control at roadworks sites.

Team Member No. 1 shall have the following skills and qualifications:

- Shall be an experienced road safety auditor.
- Shall have attended, within the last two years, a "certified" traffic control training course, or be a "Certified" traffic control training course presenter.
- Shall have experience and training for the type of temporary traffic control being audited. For example an auditor must have experience and training (TNZ Certified HCH Training) to conduct audits of high capacity highways (HCH) such as motorways and high speed, high volume expressways and rural state highways. For all other roads the auditor must have experience and training to TNZ Certified Working on the Road (including TNZ G/1) Standard.
- Shall preferably have experience on at least one previous safety audit of traffic control at roadworks sites.

Team Member No. 1 should have a safety audit background, and be interested in being the audit team leader on future audits, of this type.

Team Member No. 2 shall have the following skills and qualifications:

- The same as for Team Member No. 1, except that:

- The second team member may be new to the process. This will enable new personnel to gain experience, to become involved in future audits.

The ***Client's Representative*** shall have the following skills and qualifications:

- May be either from the Asset Management unit or the client's management or project consultant.

- Should be familiar with the policies and programmes for work being undertaken at the site(s).

This team member is always the Client's representative of their choice, and may be a member of the LTSA or NZ Police, Traffic Safety Division.

5.3 Setting the Audit Time Frame

Once the team membership is established, the Team Leader shall identify the dates for the fieldwork in consultation with the Client and the other team members.

5.4 Specifying Audit Details

Formal letters from the client to the team members shall specify the audit details. Consultants are sent formal terms of engagement documents.

The formal letters shall include *terms of reference* for the audits. For announced audits, the letter should stress the importance of the *entry and exit meetings* requesting that senior staff attend the exit meeting. Where the client is an RCA, they might want to invite councillors to the exit meeting, so clearly it has be on a day that they can attend.

5.5 Background Information

Prior to announced audits, the client should provide the Team Leader with the following information:

- A copy of the agreed level of compliance and standards adopted for traffic control at roadworks sites in the network area (see 5.6).

- A plan of the network showing the road functional classifications. (To assist the team to define the appropriate level of traffic control).

- A schematic plan showing the AADTs across the network. (To assist the team to define the appropriate level of traffic control).

- A list of known construction and maintenance activities, including work by service authorities, being undertaken on the road network.

- If requested a copy of the TMP's for the above activities.

5.6 Standards for Compliance

At the time of preparing these interim procedures, Transit is in the process of developing a "Temporary Traffic Control Manual". This manual will include and replace the current "Codes of Best Practice":

- Transit's Code of Practice for Working on High Capacity Highways.
- Transit's – Specification for Temporary Traffic Control – TNZ G1, May 1996.
- Transit's Working on the Road Handbook.

At the current time, in lieu of this manual, it is recommended the degree of individual site compliance should be measured against, as appropriate:

- Transit's Code of Practice for Working on High Capacity Highways – November 1997 draft.
- Transit G1: May 1996 – Specification for Temporary Traffic Control – including Addendum No. 1, Schedule No. 1, Appendix A, Appendix B and TNZ G1 notes, May 1996.
- Transit Working on the Road – a handbook for temporary traffic control and safety at roadworks sites – revised June 1998.
- Transit, LTSA, Manual of signs and markings – Part 1 signs – regulatory and temporary warning signs.
- Traffic Regulations, 1976 and Amendments April 1998, The Transport Act, The Construction Act and Regulations and the Health and Safety in Employment Act 1992.

5.7 Audit and Reporting Programme

At the commencement of each audit, the format for the report, and a programme which shows the timetable and response times for all parties should be prepared and agreed to by all parties. This will ensure that the final report is delivered within an acceptable timeframe and should also provide a suggested timeframe for feedback on both the draft and final reports. A sample programme is included in Appendix 5.

5.8 Equipment

5.8.1 Vehicle

The transport and safety arrangements for the Audit Team are important to ensure that the audit can be undertaken effectively and safely.

It is important that the vehicle allows all team members a sufficient view of the road to enable them to make credible judgements regarding the features for which they are responsible. Most audits will involve at least four people, and a Toyota Previa (Van) has been very successfully utilised in the previous audits.

5.8.2 Trip Meter

An accurate distance measuring device can be useful, for recording the locations of the work sites and the spacing of component features on the approach to and within the area under temporary traffic control.

5.8.3 High Visibility Clothing

Each team member shall wear a high visibility vest or jacket, complying with the requirements of Transit's Code of Practice for Working on High Capacity Highways, when alighting from the inspection vehicle.

5.8.4 Video Equipment

It is recommended that a video camera, mounted inside the vehicle, is used to film the sites inspected in both directions and on any intersecting side roads in both directions of travel. In the case of audits carried out to date, such video's have proved useful in the production of the reports and demonstrating to the Client the condition of the sites, as inspected.

5.8.5 Other Equipment

In addition to the equipment mentioned above, the team should have available:

- A camera.
- A tape measure.
- A dictaphone.
- A mobile telephone (cell phone) or a radio telephone with a connection to the Client's base unit.
- A first aid kit
- A copy of the Health and Safety Plan

6. AUDIT PROCEDURE

A summary of the full audit and reporting programme, with suggested timetable, is given in Appendix 5. (Audit and Reporting Programme: Suggested Timetable).

6.1 Entry Meeting

The audit team should commence with an entry meeting, preferably on the evening before the audit inspections. This meeting is to describe the procedures and obtain background information. The programme, see 5.7, shall be confirmed. The Client shall decide who will represent them both at this meeting and during the audit.

The safety of the Audit Team is most important. The Team Leader shall, at the commencement of the Audit, complete a briefing of the Audit Team using the checklist in Appendix 4, which deals with Health and Safety.

6.2 Inspection Programme

Audit inspections should be limited to a maximum of two days, for a full road network, to ensure a good level of concentration is maintained. From past experience, no more than 15 sites should be inspected in one day.

A proven format, for the audit process is summarised in the table below:

Day 1 (Evening)	▪ Entry meeting covering health and safety, background information, road/site selection, and the audit and reporting programme. ▪ Pre-inspection: Select the first day's detailed audit inspection programme.
Day 2	▪ Undertake audit inspections both day and night, as required.
Day 3	▪ Check notes for the first draft of the audit report, from Day 2 inspection data. ▪ Pre-inspection: Refine third day's audit inspection programme. Note: This will only cover a small sample and will not include a night inspection. ▪ Undertake audit inspection. ▪ Check notes for the first draft of the audit report, from Day 3 inspection data. ▪ Prepare key issues to be presented to the exit meeting, if an announced audit. ▪ Exit meeting: Discuss with the Client the general impressions and general audit findings, if an announced audit.

NOTE: For announced audits, no entry and exit meetings, with the client, will be held.

6.3 Road Selection/Site Selection

The selection of roads to be audited shall be made by the audit team, who should not be influenced by the Client's representative. This will enable the team to undertake a completely independent audit with the sites being randomly selected as they are found on a particular route.

The team may, however, use information, provided by the Client, with respect to the location of the known "on road" activities (construction, maintenance and service authority work sites), when choosing the roads and / or routes to be inspected.

The sample selected should be a representative mix of:

- Urban roads.
- Rural roads.
- Construction sites.
- Maintenance and service authority sites.
- And if possible, mobile operations.
- High and low traffic volume sites.

The selection process may be modified for specific audits, such as those undertaken for a contracting company.

6.4 Health and Safety, and TMP's for the Audit Process

An example Health and Safety Plan is shown in Appendix 4. All team members shall read the plan and sign it to confirm that they have been briefed and that they are comfortable with the way the audit will be carried out and with the provisions of the plan.

All team members shall provide their own safety and protection equipment, which shall be worn and used at all times when on the road, out of the inspection vehicle.

The Team Leader is responsible for providing the plan and briefing the team.

If the inspections involve using the road in a manner different from that of a normal road user, the Team Leader shall provide a TMP to cover this activity.

6.5 Background Information

The Team Leader should brief the team on the information that has been gathered from the Client and other sources. In respect of the audit activities the Team Leader should be considered to be the audit activities site traffic management supervisor (STMS).

6.6 Pre-Inspection

Prior to commencing the audit inspection, on each day the audit team should meet and be briefed on:

- The day's programme.

- Description of road being audited including:
  - ➢ Traffic volumes
  - ➢ The expected level of service, with regard to traffic control, for the roads to be inspected.

- Agreement on the duties to be fulfilled by each team member. Team members need to decide their positions in the vehicle to suit their inspection task.
  - ➢ Agreement on who will drive – (not the RCA representative)
  - ➢ Agreement on who will complete the audit check sheets.
  - ➢ Agreement on who will draw the diagrams of each site.
  - ➢ Agreement on who will video each site.
  - ➢ Agreement on who will draft the report.
  - ➢ Agreement on who will take the photographs.

- Health and Safety requirements.

6.7 Inspection Methodology

To minimise the costs of undertaking these audits, it is recommended that the inspections are undertaken during the "construction and maintenance season", when most of the work on the road network is being undertaken.

Taking into account the fact that 44% of the crashes at roadworks sites occur during the hours of darkness and that on HCH sites many construction and maintenance activities take place at night, time should be allocated for:

- Night inspections of active work sites.
- Night inspections of unattended, longer term work sites. Preferably sites that have been inspected during daylight hours.

NOTE: During the pilot Safety Audits of Traffic Control at Roadworks Sites, no night inspections were undertaken. Therefore, knowledge on this aspect of the process is limited. The need for night inspections is recommended for known activities as detailed above.

Each member of the team, exclusive of the nominated driver, shall have a role / task. (See 6.6). These tasks should be alternated among team members during the audit inspections.

The driver is not assigned any other duties to undertake, but can provide feedback to the team, on a "road users" perspective with regard to the safety or otherwise of each site.

Each roadworks site (on road activity) which is encountered should be driven through a minimum of three times as follows:

- ***First drive through***

  - ➢ Record site location, road controlling authority and contractor.

  - ➢ Check on the three main roadworks components:
    (i) Advanced warning zone.
    (ii) Direction and protection zone.
    (iii) End of works zone.

  - ➢ Check on construction / maintenance work practices and their suitability for the site and activity.

  - ➢ Check on:
    (i) Extent of roadworks hazard area.
    (ii) Traffic flows adjacent to and through site.
    (iii) Footpath / pedestrian hazards / provisions.

  - ➢ Identify intersections.

  - ➢ Video site including main approaches and exits.

  - ➢ Turn and stop
    - Sketch roadway and basic site layout.
    - Fill in inspection check sheet.

- ***Second drive through***

  - ➢ Complete inspection check sheets.

  - ➢ Video site in reverse direction.

  - ➢ Turn and stop
    - Complete sketch including signs and delineation layout, cyclist and pedestrian protection, hazard protection, and equipment protection.
    - Comment on traffic control methods and effectiveness of these.
    - Comment on suitability of construction work practices.

- ***Third drive through***

  - ➢ Check and comment on intersection signage.

➢ Video roads intersecting with main road.

➢ Stop
- Complete sketch of existing temporary traffic control layout.
- Complete inspection check sheet including comments.
- Photograph items of interest / concern
- From the site hazard estimation formula check sheet, compile and agree on the "site hazard rating" for the site.
- Take action if necessary depending on the risk / hazard of the site inspected.

Note:

- The site inspection check / prompt sheet is shown in Appendix 1.
- The site hazard rating estimation formula check sheet is shown in Appendix 2.
- The site hazard rating details are shown in Appendix 3.

If the team considers that a site, which has just been inspected is "critical", and where the "site hazard rating" exceeds 2501, see Appendix 3, the following action should be taken:

➢ **Check results and agree on the site problems.**

➢ **Formulate a brief report on the hazards and suggested steps to rectify the problems.**

➢ **Before leaving the site, contact the RCA by telephone or radio and relay the teams concerns with regard to the safety of the site, and ask them to take the appropriate action.**

➢ **If requested to do so by the RCA, leave a copy of the report with the site traffic management supervisor or the "contractor's" site manager.**

➢ **Following the completion of that days inspection, fax or deliver a copy of the report to the RCA.**

In the case of unannounced audits, the above steps must be followed. The safety of road users and/or site workers is more important than maintaining the unannounced aspects of the audit.

Night inspection of sites, both active and unattended should generally follow the above methodology. It is worth noting that the need to photograph and video sites at night generally requires sophisticated equipment that may be beyond the scope of these audits.

6.8 Post Inspection Meeting and Report Drafting

Following the completion of the inspections, preferably the morning following any night inspection, the team shall meet and agree on the draft format of the general issues to be recorded. The decisions made should reflect those of the Audit Team and not be influenced by the Client's representative, whose role is to provide local knowledge and background data.

The team should also check inspection notes, drawings and check sheets for each site, before commencing the inspections for that day.

6.9 Exit Meeting

6.9.1 For Announced Audits

The aim of the exit meeting is to provide early feedback to the Client and give opportunity for the clarification of local issues.

For this to be effective it is important that Client's Senior Staff attend. They may, if appropriate, invite a representative of their governing body and / or their consultants to attend.

The Audit Team should prepare a summary of both positive and negative aspects of the audit to present to the exit meeting, be prepared to receive explanations regarding local practices, and acknowledge the assistance of the Client. This summary should form the basis for the executive summary for the final audit report.

This meeting should take between one and two hours.

6.9.2 For Unannounced Audits

The exit meeting for this type of audit, should be viewed as the last on site task of the audit team. The team should prepare the draft of the executive summary. The summary should develop the general aspects of the audit observations both positive and negative.

7. AUDIT REPORTING

7.1 Reporting Process

The completed report should be processed in a similar way to all Transfund Review and Audit Division Reports as shown below. This process may, however, be varied if the audit is being undertaken directly for the Road Controlling Authority or a Contracting Organisation, to suit their requirements.

- Immediately following the audit, a letter summarising the findings should be sent to the CEO(s) of the RCA(s) or the client.

- Preliminary draft report, prepared by Team Leader.

- Preliminary draft report sent to:
  - ➢ Client
  - ➢ All team members for vetting and verification.

- From comments received, Team Leader prepares the draft report.

- Draft report sent to:
  - ➢ Client
  - ➢ RCA's Asset Manager

- RCA's Asset Manager to provide comment on:
  - ➢ Factual errors
  - ➢ Omissions
  - ➢ Disagreement with any opinions expressed

  These comments will be appended to the final report.

- Final report to:
  - ➢ Transfund Safety Audit Manager
  - ➢ All team members
  - ➢ RCA's Asset Manager or
  - ➢ Client

- Implementation Report

7.2 Report Format

Shall generally follow the format set out in Appendix 6 and should include the following:

7.2.1 Disclaimer for draft and final reports

7.2.2 Executive Summary

Briefly summarise the extent of the audit, general observations, good points and aspects that could be improved by the Client. This should generally follow the report given at the exit meeting.

7.2.3 Introduction

Standard introduction as to why the safety audit was undertaken for the Client. State the objectives of the audit and introduce the audit team.

7.2.4 Methodology

State audit dates and discuss procedures of the audit.

7.2.5 Location of Study

Briefly discuss routes driven and sites selected, include map showing these routes / site locations.

7.2.6 Safety Audit Findings

These are prepared, for each site, using the information gathered during the audit inspections.

Each site should be examined and reported on individually.

The findings for each site should include:

- Location of Site - State highway or road name and route position or position relative to known feature.
- Road Controlling Authority - Required where the audit is conducted over a wide area and includes roads administered by different RCAs.
- Contractor - If known.
- Type of Work - Brief description of the "on road" activities being undertaken at the time of the audit inspection.
- Traffic Volumes - For road(s) audited.
- Permanently Posted Speed Limit - For the road(s) audited.
- Comments on Observations - Brief comment relating to the inspection observations. Both good and bad aspects should be included. The level of compliance with TMP, if available, should be included.
- Photographs - Include if applicable.
- Site Hazard Rating - This is a measure of the "risk" at this site and is compiled from the Site Hazard Rating Estimation Formula check sheet (see Appendix 2).

- Recommendations - These should include comment on actions, relating to each site, to:
  (i) Remedy hazards observed.
  (ii) Remedy non compliance with TMP (if available).
  (iii) Ensure Contractors present and future compliance.

- Diagrams of temporary traffic control at the site:
  (i) As observed during inspection.
  (ii) Complying temporary traffic control for the activities observed at the site.
  Note: These diagrams, should be included in Appendix A of the audit report.

- Completed Site Hazard Estimation Formula Check Sheets – These check sheets, should be included in Appendix B of the audit report.

7.2.7 Recommendations

These comments should result from the general findings of the audit. They may include recommendations to the Client with regard to:

- The consistent application of standards.
- The development of procedures to improve safety.

They may include recommendations to Transfund, with regard to National Improvements to:

- Review regarding improvements of these "Interim" procedures.
- Review of National Standards regarding Temporary Traffic Control for "on road" activities.

7.2.8 Implementation Report

To be completed by the Client, within one year, from the date of the audit, and forwarded to the Team Leader.

This report should state actions taken to ensure that problems observed, have been addressed and are not ongoing.

7.2.9 Appendices – These will include:

- Comment received from the Client with regard to the "Draft" audit report.
- Copy of the Health and Safety Plan, used during the audit.
- Diagrams of temporary traffic control at each site:
  (1) As observed during inspection.
  (2) Complying temporary traffic control for the activities observed at the site.

- Completed Site Hazard Rating Estimation Formula check sheets – these are complete by the team, before leaving each site inspected.

The appendices may include:

- Copies of the completed site inspection check sheets.

To enable the development of these procedures and to ensure all views are taken into account, it is requested that a copy of any audits, conducted in terms of these interim procedures be forwarded to the Safety Audit Manager, Transfund New Zealand, National Office, P O Box 2331, Wellington. This request includes audits undertaken for organisations other than RCAs.

The results of all audits will be analysed and the results used to formulate the "final" procedures.

APPENDIX 1
Site Inspection Check Sheets

APPENDIX 1 : SAFETY AUDIT - TRAFFIC CONTROL AT ROADWORKS SITES

Site No.: .....
Recorded By: .....
Date: .....
Approx. Time: .....
Location of Site: .....
.....
Description of Work Type: .....
Road Controlling Authority: .....
Name of Contractor: .....

Prompts Y / N = Yes / No
A-S-N = All-Some-None

			Comments:
< Signage:			
•	Visibility	A-S-N	.....
•	Placement	A-S-N	.....
•	Height	A-S-N	.....
•	Size	A-S-N	.....
•	Quality		
	Acceptance	A-S-N	.....
	Marginal	A-S-N	.....
	Unacceptable	A-S-N	.....
< Delineation			
•	Cones	A-S-N	.....
•	Drums	A-S-N	.....
•	Barricades	A-S-N	.....
•	Other	A-S-N	.....
< Protection			
•	Excavations	Y / N	.....
•	Pedestrians from work	Y / N	.....
•	Pedestrians from traffic	Y / N	.....
•	Cyclists from work	Y / N	.....
•	Cyclists from traffic	Y / N	.....
< Worksite Zone/Hazard Area			
•	Safety space	A-S-N	.....
•	Vehicle hazard lights	A-S-N	.....
•	Vehicles operating with traffic flow	A-S-N	.....
•	Vehicles parked with traffic flow	A-S-N	.....
•	Vehicles outside zone	A-S-N	.....
•	Entering / leaving with traffic flow	A-S-N	.....
•	Workers safety	A-S-N	.....
•	Site supervisor / traffic controller	Y / N A-S-N	.....
<Principal Zones Correct			
•	Advance warning	Y / N	.....
•	Direction	Y / N	.....
•	Protection	Y / N	.....
•	End of works	Y / N	.....

Site No. .....

SKETCH / DIAGRAM OF ACTUAL WORK SITE

APPENDIX 2
Site Hazard Rating Estimation Formula Check Sheet

SITE HAZARD RATING ESTIMATION FORMULA CHECK SHEET

Site No: **Location:**

Site Hazard Rating = A x B x C

Site Condition Factor (A)	
X	
Site Complexity Factor (B)	
x	
Traffic Effects Factor (C)	
Total - SHR	

Traffic Effects Factor (C)

Site Location	Factor
Works Not In Carriageway	1
Works on Shoulder	3
Traffic Moved into temporary Lanes	5
Traffic Merged into Reduced Number of Lanes	7
Traffic passing Site in Single Lane	10
Selected Value - Traffic Effects Factor (C)	

Site Complexity Factor (B)

	Highest Approach Operating Speed				
ADT	50	60	70	80	100
0-500	1	2	3	4	5
501-1000	2	3	4	5	6
1001-5000	3	4	5	6	7
5001-10000	4	5	6	7	8
10000+	5	6	7	8	10

Selected Value

Intersection Factor

No Intersections affected enter 1

Intersection's affected enter 1.5

Selected Value **X**

Result **=**

Footpath users affected by works

Not Affected	50	60	70	80	100
0	+1	+2	+3	+4	+5

Selected Value **+**

Site Complexity Factor (B) **=**

Site Condition Factor (A)

Signs	Points	Tally Box	Total
Omitted - on main route	5 for each sign omitted		
Omitted - on side road	2 for each sign omitted		
Used unnecessarily	1 for each sign used unnecessarily		
Spacing too close	2 for each sign spaced too close		
Not Visible	2 for each sign not visible		
Condition Marginal	1 for each sign in marginal condition		
Condition Unacceptable	2 for each sign in unacceptable condition		
Order incorrect	2 for each sign out of order		
Permanent Signs Not Covered	2 for each sign not covered		
Non Gazetted Signs Used	3 for each sign used		
Sign on not on LHS but on RHS	1 for each sign so installed		
Sign too Low/Small	1 for each sign so installed		
Signs not Visible at Night	2 for each sign not visible at night		
Speed Restriction not Appropriate	5 for each deviation from appropriate limit		
		Subtotal	

Channelling Systems	Points	Tally Box	Total
Not Used	20 points		
Tapers too short	10 for each taper		
Spacing inadequate in tapers	5 for each taper		
Spacing inadequate in lanes	5 for every 100 metres this exists		
Condition Marginal	1 for each device in marginal condition		
Condition Unacceptable	2 for each device not acceptable		
Device too small	1 for each device too small		
44 Gallon Drums	2 for each drum in use		
Using non approved device	1 for each device in use		
		Subtotal	

Miscellaneous	Points	Tally Box	Total
Pedestrians Forced into Live Lane	5 for each affected footpath		
Pedestrians Forced into Work Area	5 for each affected footpath		
Road Surface Condition Rough	5 for every 100 metres		
Safety Zones Compromised	5 for each occasion		
Working in Live Lanes Hazardously	10 for each occasion		
Flashing Lights not Used/Ineffective	1 for each vehicle		
High Visibility Jackets not Worn	5 for each individual		
High Visibility Jackets not Visible	3 for each individual		
Site Length Excessive	5 for every 500 metres over 1 km		
		Subtotal	
		TOTAL SCF - (A)	

APPENDIX 3
Site Hazard Rating Details

Appendix 3 : Site Hazard Rating Details

The site hazard rating is assessed by calculation of the factors and parameters recorded for each site inspected, using:

- Site observations
- Information from the Site Inspection Check sheets (see Appendix 1)
- Information from this Site Hazard Estimation Formula check sheet (See Appendix 2)

The Site Hazard Rating (SHR) is used to give an objective, numerical assessment of the real and / or potential hazards observed at the time of each site inspection.

The SHR levels are defined as follows:

- **SHR = 0 to 300 – Satisfactory** Full compliance - minor faults which do not affect safety – no remedial action required.

- **SHR = 301 to 1500 - Marginal** - Safety is being compromised – record defects and advise Client via audit report.

- **SHR = 1501 to 2500 - Serious** - The site is in a hazardous condition – serious safety deficiencies exist. Record defects and advise RCA and / or consultant, to ensure that immediate action is taken to minimise the hazard and to remedy the defects / hazards.

- **SHR = +2501 – Critical (Extreme Hazard)** - The site is in a critical condition – The following action **must** be taken:
  - Check results of SHR
  - Formulate a brief report and suggest steps to rectify the problems
  - Before leaving the site, contact the RCA by telephone or radio, relay the teams concerns with regard to safety of the site and ask them to take the appropriate action.
  - If requested to do so by the RCA, leave a copy of the report with the site traffic management supervisor or the "contractors" site manager.
  - Following the completion of that days inspection, fax or deliver a copy of the report on the site to the RCA.

Note: The SHR levels, for example + 2501 – Critical, are provisional figures. These have been based on the pilot Safety Audits of Traffic Control at Roadworks Sites undertaken to date. The rating figures, for each level, need to be verified, and may be amended, based on experience gained during future audits.

The Site Hazard Estimation Formula, check sheets and the SHR is not a scientific system, but is based on "judgement calls" by experienced auditors. The system has been tested, in use, during the "pilot" safety audits carried out in 1997 and 1998.

It has not been tested by having more than one team inspecting the same site, and comparing results and it has not been subject to cross checking against the various "levels" of traffic control: ie – HCH and TNZ G1.

However, the results to date, and modifications made to date suggest that the SHR system is robust enough to accurately show the difference between the various hazard/risk levels.

Comment on any improvements to the SHR system is welcomed and should be forwarded to:

- ***Dr Ian Appleton,***
  Safety Audit Manager
  National Office
  Transfund New Zealand
  P O Box 2331
  WELLINGTON

  E-Mail: ian.appleton@transfund.govt.nz

Or

- ***Mr Jeff Kaye***
  National Highway Safety Co-ordinator
  Opus International Consultants Ltd
  P O Box 1482
  CHRISTCHURCH

  E-Mail: Jeff.Kaye@opus.co.nz

APPENDIX 4
Health and Safety Plan

Appendix 4 : Health and Safety Plan for Safety Audit of Traffic Control at Roadworks Sites

Team Leader to file with Client when completed, and before site inspections.

Client: ……

Date: ……../……../……..

Audit Team	Name	Confirmation of H&S Briefing
Team Leader		
Team Member No. 1		
Team Member No. 2		
Client's Representative		

TEAM LEADER'S BRIEFING TOPICS

Safety Hazards Summary

- Inspection vehicle: Road crash risks, use in terms of mobile operations
- Team member (pedestrian): Pedestrian vs vehicles risks.
- Team member health hazards: sun, rain, cold etc

Preventative Measures

Vehicle;

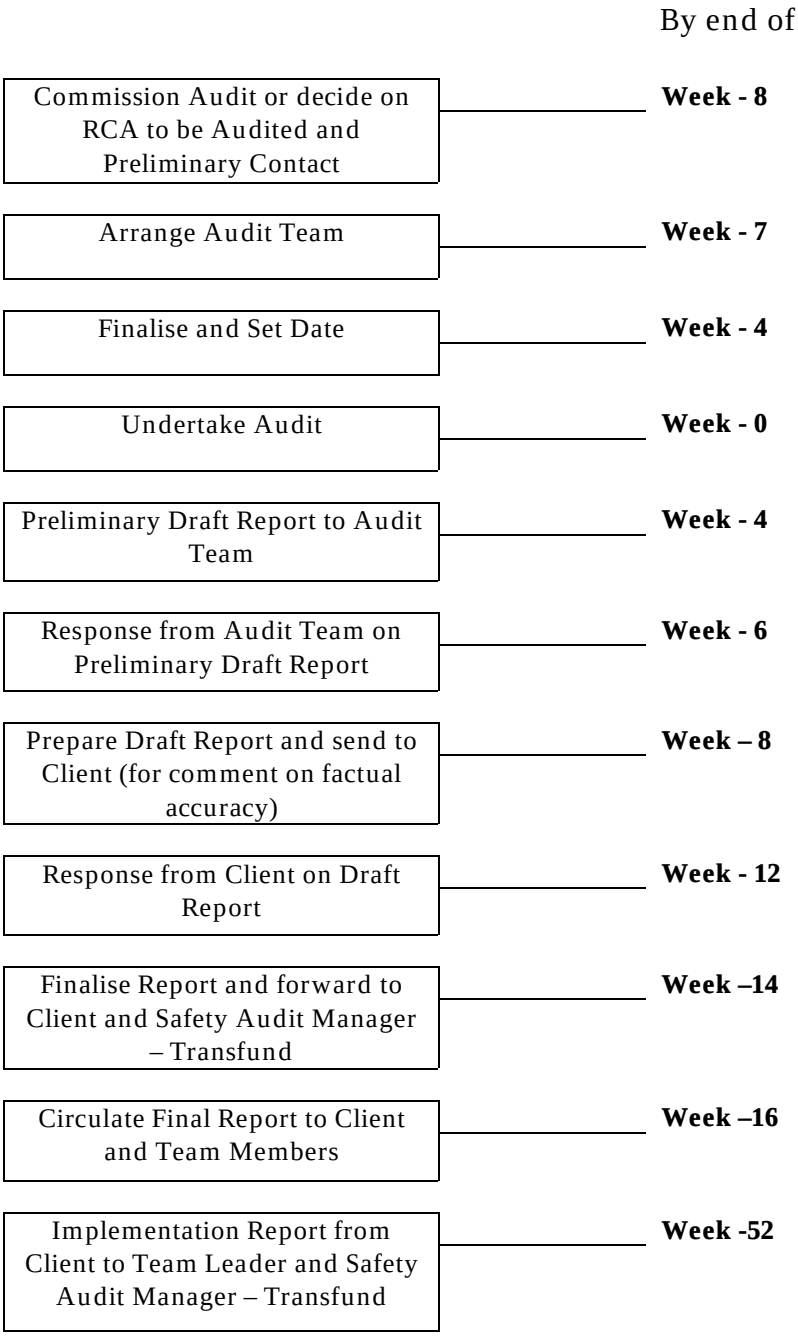
- Comply at all times with the road rules (Reg, WOF, licensed driver).
- Drive defensively
- Ensure the driver is not required to undertake tasks which would cause distraction from driving task

Team Members must:

- Always wear high visibility safety clothing when outside of the vehicle.
- Comply with TNZ's HCH, GI and Working on the Road requirements, as appropriate.
- Ensure that another team member 'watches the backs' for members undertaking detailed on carriageway inspections.
- Ensure they have suitable clothing (coat, hat, etc) and use them when appropriate.
- In the event of a crash either involving or witnessed by the Team:
  - ➢ Provide immediate assistance where possible
  - ➢ Notify emergency services
  - ➢ When the Team is involved, affected members must notify their own organisations and follow their internal Health and Safety procedures.

APPENDIX 5
Audit and Reporting Programme: Suggested Timetable

Appendix 5 : Audit and Reporting Programme: Suggested Timetable



NOTE: Refer steps (i) and (k). It is requested that a copy of all reports, for audits conducted in terms of these interim procedures be forwarded to the Safety Audit Manager, Transfund New Zealand, National Office, P O Box 2331, Wellington. This request includes audits undertaken for organisations other than RCA's. The results of all audits will be analysed and used to formulate the "final" procedures.

APPENDIX 6
Safety Audit Report Format Proforma

Report No. RA 99/XXXS File No.

TRANSFUND NEW ZEALAND

SAFETY AUDIT OF TRAFFIC CONTROL AT ROADWORKS SITES

PROFORMA REPORT

(BOONAH DISTRICT COUNCIL)

Prepared By: ……..……
T Leader, A Consultant Limited

Reviewed By: ……..……
Safety Audit Manager

Approved By:..……
Review and Audit Manager

This proforma report is an example of a Transfund audit carried out on sites located within a particular RCA area. This format should be followed by "others" but modified to suit the need of the type of client.

Date of Report

DISCLAIMER FOR TRANSFUND DRAFT REPORTS

Disclaimer

This is a draft report and it is subject to change. It has been prepared in the discharge of Transfund New Zealand's legal responsibility to audit the performance of *[local authorities against regional programmes and district roading programmes/Transit New Zealand against its state highways programme].

The findings, opinions and recommendations in the report are based on the examination of a sample only, and may not address all issues existing at the time of the audit. The report may also deal with technical matters. So readers are urged to seek specific advice on particular matters and not to rely solely on the report.

While every effort has been made to ensure the accuracy of the report, it is made available strictly on the basis that anyone relying on it does so at their own risk without any liability to Transfund New Zealand.

DISCLAIMER FOR TRANSFUND FINAL REPORTS

Disclaimer

This is a final report. It has been prepared in the discharge of Transfund New Zealand's legal responsibility to audit the performance of *[local authorities against regional programmes and district roading programmes/Transit New Zealand against its state highways programme]. A draft of the report was referred to *[*name of District/City Council being audited]* for comment.

The findings, opinions and recommendations in the report are based on an examination of a sample only, and may not address all issues existing at the time of the audit. The report may also deal with technical matters. So readers are urged to seek specific advice on particular matters and not to rely solely on the report.

While every effort has been made to ensure the accuracy of the report, it is made available strictly on the basis that anyone relying on it does so at their own risk without any liability to Transfund New Zealand.

CONTENTS

1. EXECUTIVE SUMMARY

This report presents the findings of an audit of a traffic control at roadworks sites in the (Boonah District Council) area undertaken by a Transfund New Zealand Safety Audit Team. The purpose of the audit is to identify issues and suggest recommendations that will contribute to increasing road safety of roadworks sites in the district.

The audit of the network was undertaken between (Monday, 9 August 1999 and Tuesday 10 August 1999), in fine weather conditions. It followed the procedure described in the Transfund New Zealand "Interim Procedures for Safety Audits of Traffic Control at Roadworks Sites – Report No. RA 98/689S."

It was agreed that the team should audit selected lengths of various roads as typical examples of road hierarchy, condition and environment in the district(s). The sites audited were selected at random, by driving a preselected route. The audit was an announced audit, undertaken with the full knowledge of the (Boonah District Council) Road Asset Manager.

The inspections were carried out during day and night and both "active" and "unattended" sites were inspected.

Safety problems highlighted by the audit team should enable a remedial treatment programme to be prepared. It will also enable further safety studies and strategies to be implemented over wider areas of the roading network than those inspected during the Audit to improve safety at roadworks sites.

The team observed (30) sites, over the two days of the audit and the safety or otherwise of each site was rated by using the Site Hazard Rating (SHR), to obtain a points value rating.

The following table summarises the audit findings:

Site Danger Factor	**0-300 (satisfactory)**	**301-1500 (marginal)**	**1501-2500 (serious)**	**2501 plus (critical)**
No. of sites	5	13	6	6

The lowest SHR recorded was **15.**
The highest SHR recorded was **6700.**

The main or recurring defects, observed during the audit, are grouped under the worksite zone subheadings, **Advanced Warning, Direction and Protection, End of Works** and **Construction Work Practices and Road User Safety** and are briefly described as follows: (for example):-

Advanced Warning Zone

- Insufficient advanced visibility to first advance warning signs – in urban area signs were hidden by parked vehicles.

- Use of "illegal" signs.

- Erection of signs incorrect – use of non-frangible supports (large truck rims) – sign supports not sandbagged hence signs blown down.

Direction of Protection Zone

Delineation Equipment

- Cone tapers if installed were, in all cases too short – maximum length observed was 5 cones.

- White painted 44 gallon drums common at many work sites.

- At many active sites excavations were not separated from through traffic with any type of delineation.

Signs

- TW-23 (detour) signs erected, when no detour was in place. On three sites these signs were erected when there were no side roads and no detour was available.

- TW-27 (one lane) signs were installed on roads with high traffic volumes.

- At all sites where TW-27 (one lane) signs, were used to indicate road narrows, the associated RG-19 (single lane – give way) and RG-20 (single lane – priority) signs were missing. In many cases the use of TW-27 signs could have been overcome by the installation of a coned lane for each direction of travel.

End of Works Zone

- This zone of the worksites inspected was, in nearly all cases, poor.

- Signs were usually erected back to back with the advanced warning signs, and hence were erected on the wrong side of the road – should be on the LHS of road.

- Side roads generally did not have any end of works zone signage installed.

Construction Work Practices

- On all reseal, shape correction and reconstruction sites, the full width of the roadway was being worked on. No coned off lanes were provided for the road user. In many cases road users, having been given the "Go" sign by the manual traffic controller, were faced with negotiating the work sites in which construction equipment was operating, sometimes against the flow of traffic. Construction works require better planning to ensure that drivers can pass through the worksite via a coned off lane in which no construction equipment will ever operate.

- Little or no attention was paid to pedestrian protection, cyclist protection and to delineation and protection of open excavations – the Department of Labour handrail regulation do apply to roadworks sites.

- It was not uncommon to see site workers not wearing high visibility clothing. If they were wearing the jackets / vest they were more than likely covered in dirt and were not the approved colour.

Road User Safety

- On most sites, although the traffic control was not complying, road users managed to negotiate the sites safely.

- On sites where drivers were confronted with operating construction equipment in their lane, the potential for an incident increased significantly and hence the level of confidence and safety dropped.

- On worksites where the footpath was blocked off no allowance had been made to provide an alternative footway. This resulted in pedestrians walking in the traffic lane – a highly hazardous activity considering that these lanes may have been narrowed to 3.0 m or less.

The safety audit report, which follows this summary provides a full report and recommendations for action on the above and other observed features.

2. INTRODUCTION

This safety audit of (Boonah District Council) was undertaken using the 'Interim Procedures' for Safety Audits of Traffic Control at Roadworks Sites (February 1999 – Report No. RA 98 / 689S).

These procedures, developed for Transfund New Zealand Review and Audit Division, provide a method of undertaking a peer review of the safety features or defects, on a sample of randomly selected roadworks sites.

It is recommended that the findings of the report be used to assess the remainder of sites, in the (Boonah District Council) network, currently and in the future.

3. OBJECTIVE

The objectives of a safety audit of traffic control at roadworks sites are:

- To identify potential safety problems for road users and others.

- To ensure that measures to eliminate or reduce the identified problems are considered fully by the (Boonah District Council).

- To seek consistency across the nation's total network and influence policy weaknesses.

The safety audit will:

- Help minimise the risk and severity of crashes that may be attributed to the installation of temporary traffic control on all roads.

- Optimise whole of life maintenance and operation benefits for road network.

- Improve the awareness of safe practices for all on road activities.

- Help Transfund determine the effectiveness of its resource allocation for the provision of a safe and efficient roading network.

- Identify, primarily from a road user's perspective, those issues and features which give misleading or confusing messages.

This safety audit highlights safety concerns identified by the team.

4. METHODOLOGY

This audit was undertaken in terms of Transfund New Zealand's Interim Procedures for Roadworks Sites, Safety Audits of Traffic Control at Roadworks Sites, February 1999. This audit was an "announced" audit, undertaken with the full knowledge of the (Boonah District Council) Road Asset Manager.

The team members for the audit were:

- (T Leader)
  (A Consultants Ltd)
  (Team Leader)

- (S Member)
  (Another Consultant Ltd)
  (Second Team Member)

- (A Manager) Roading Asset Manager
  Similar District Council
  (independent RCA Team Member)

- (A Person) (Boonah District Council), accompanied and assisted the team for the duration of the audit. *(Note: The RCA representative would not be included for an unannounced audit).*

(List other personnel involved with the audit).

The audit team held an entry meeting on the evening of (Sunday 8th August 1999).

The audit of the network was undertaken between (Monday 9 August 1999 and Tuesday 10 August 1999).

The Audit Team held an exit meeting with the following representatives from the Boonah District Council on (Tuesday 10 August 1999).

- A Bluff, Councillor
- D Pipe, Civil Division Manager
- P Hole, Roading Asset Manager

Because of the extent of road network in the district, it was agreed by the team to audit a sample of roadworks sites, randomly selected on a predetermined route, within the network (refer Section 5 of this report).

The inspection was undertaken in accordance with the interim procedures.

Section 6 of this report details the findings of the team with regard to the sites inspected.

After inspection, and before leaving each site the team agreed on the "Site Hazard Rating" (SHR) for the site, in terms of Appendix 2 and Appendix 3 of the Interim Audit Procedures.

5. ROUTE DESCRIPTIONS

The following selected routes were investigated during the two day safety audit.

	Route Name	Hierarchy	AADT	Seal Width (m)	Notes	
Day 1						
	First Road (A to B)	Arterial	4890	7.5	Urban Bypass	Day and Night
	Second Road (A to B)	Collector	931	6.0	Tourist Route	
	Third Road (A to B)	Local	485	6.00		
	Fourth Road (A to B)	CBD Arterial		7.5-12.0	Heavy Transport Route	
Day 2						
	Alpha Road (A to B)	Arterial	5603 2976	7.0-9.5	High Traffic Growth	Day Only
	Betta Road (A to B)	Collector	1068	6.5	Revoked SH	
	Gamma Road (A to B)	Collector	294	6.0	Tourist Route	

(Insert map of District showing routes inspected)

Figure 1 : Inspection Routes

6. SAFETY AUDIT INSPECTION FINDINGS

The following is a summary report on the roadworks sites that were inspected as part of the safety audit process.

For further details of each site inspected see:

- Appendix A, of this report, for:

  (i) Diagrams of existing site layout – as inspected
  (ii) Diagrams of site layout – complying with standards and regulations

- Appendix B, of this report, for:

  (i) Completed site check sheets

(The following is an example of reporting on findings, for each site inspected).

6.1 Site One – 1-10-98

- Location: Boonah Township – Boonah-Rathdowney Road
- RCA: Boonah District Council
- Contractor: Rathdowney Southern Drainage Ltd
- Type of Work: Trenching across road for drainage repairs
- Traffic Volume: 4890 VPD (1997)
- Posted Speed Limited: 50 km / hr

Medium to high risk site with good visibility on Boonah – Rathdowney Road.

Old “illegal” roadworks sign (black and yellow) used in eastbound direction. No advanced signage on Meekin Street, Ians and Jeffreys Roads.

TW-27 one lane signs erected showing roadway construction on wrong side of sign. No RG-19 and RG-20 priority signs erected in conjunction with TW-27 signs. Traffic volumes too high for this type of traffic control. Two to three cone taper, too short. Site protection consisted of cones and mixed with white barricade boards.

No works end or speed derestriction signs erected. No flashing lights operating on construction equipment.

Two of the three workmen on site not wearing high visibility clothing.

No barrier protection between worksite and foopath (may not be critical due to low pedestrian volumes).

PHOTOGRAPH

Site One 1-10-98 Boonah – Rathdowney Road Looking West
Note: Incorrect use of TW-27 sign and mixed delineation around worksite

- **Site Hazard Rating – 2448**

- **Recommendations**

  The signage and delineation needs to be improved by:

  - ➢ Removing illegal signs
  - ➢ Erecting advanced warning signs on site roads
  - ➢ Installing correct cone delineation
  - ➢ Installing "end of works" and "speed derestriction" signage on all roads.
  - ➢ This site requires manual traffic control for construction activities, as indicated.
  - ➢ An alternative, safer option, for traffic management would be to adopt an installation as per page 38 of the TNZ "Working on the Road Handbook".

7. RECOMMENDATIONS

Based on observations made in the Audit Report, the Safety Audit Team recommends the following safety improvements.

Local Authority (Local Improvements)

1. (Develop and apply consistent standards on all roads based on the hierarchy and predicted level of service, with regard to traffic control.

2. (Review the District Council's strategy for ensuring Contractors implement complying standards with regard to traffic control at roadworks sites).

3. etc

Transfund New Zealand (National Improvements):

1. (Review the national policy for temporary traffic control at roadworks sites) – suggest changes.

2. (Review the interim procedures for safety auditing of traffic control at roadworks sites) – suggest changes.

8. AUDIT TEAM STATEMENT

The Safety Audit was undertaken to provide an overview of safety issues at temporary traffic control sites within the (Boonah District Council's) area. The team does not guarantee to have identified all of the safety issues relating to the sections of road surveyed.

The Audit Team has surveyed only a sample of sites within the District, but anticipates that the findings and recommendations may be appropriate throughout the whole District.

The Safety Audit Team has endeavoured to identify features of the Boonah District Council Roads with regard to traffic control at roadworks sites, that could be modified in order to improve safety. The problems identified have been noted in this report, together with the recommendations which should be studied for implementation.

Signed:……
Date:……..
T Leader, A Consultants Ltd.

Signed:……
Date:……..
T Member, Senior Roading Engineer, Another Consultant Ltd

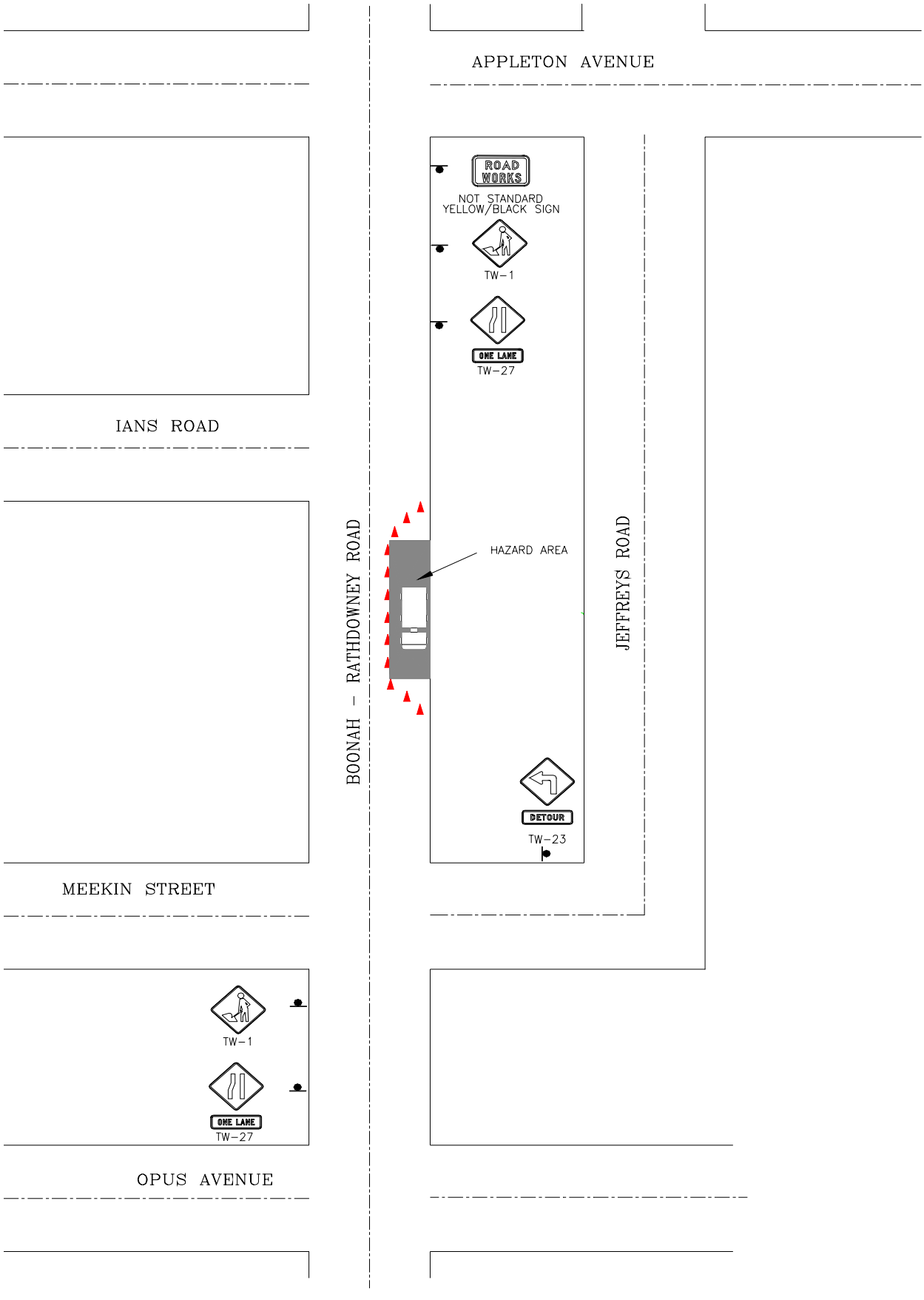
Signed:……
Date:……..
A Manager, Similar District Council

APPENDIX A
Diagrams of Temporary Traffic Control:

(i) As observed during inspection
(ii) Complying site layout

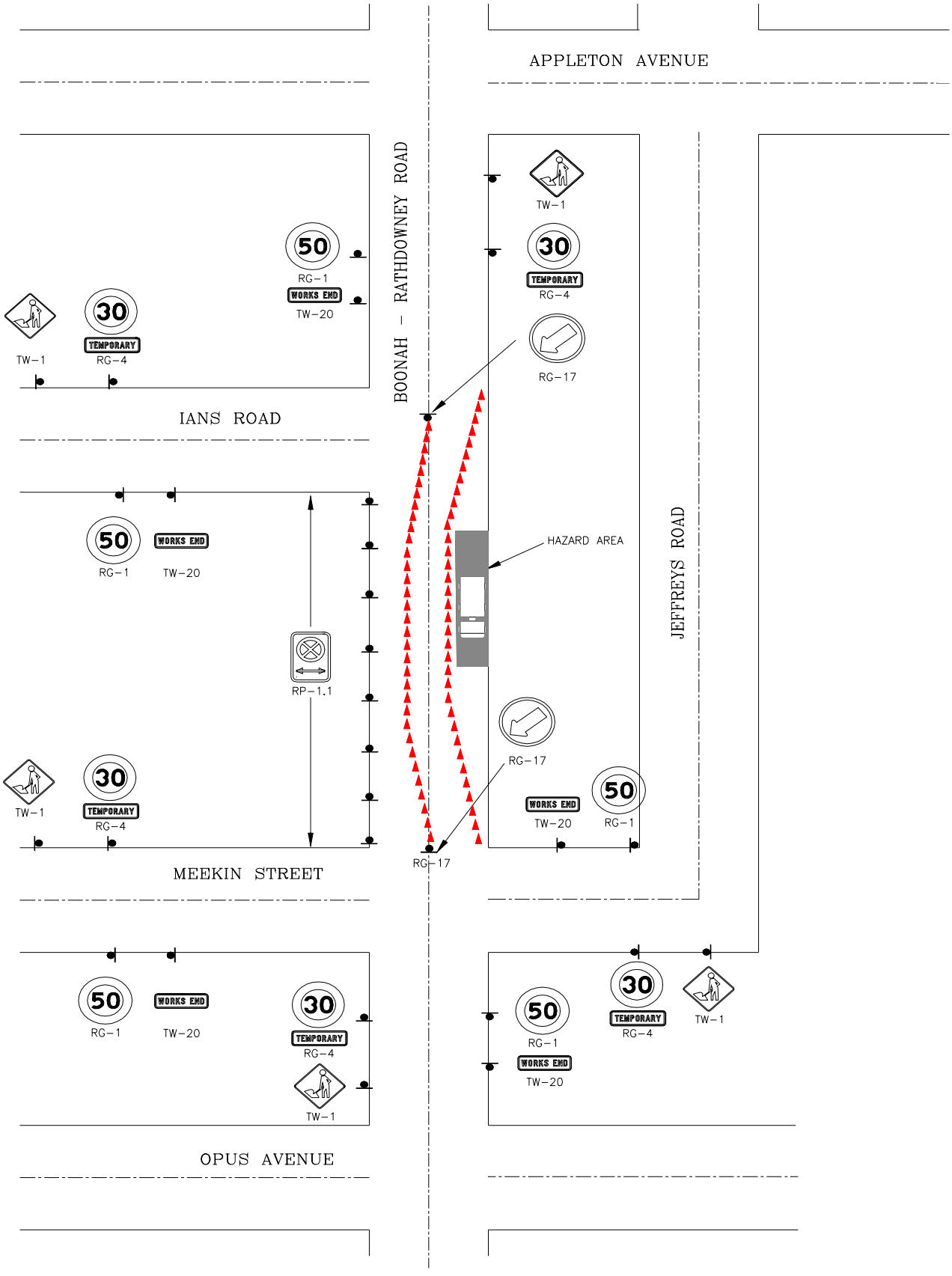
SITE No 1 – DIAGRAM OF SITE AS INSPECTED

BOONAH DISTRICT COUNCIL – BOONAH TOWNSHIP



SITE No 1 – DIAGRAM OF COMPLYING TRAFFIC CONTROL

BOONAH DISTRICT COUNCIL – BOONAH TOWNSHIP



APPENDIX B

Completed Site Hazard Estimation Formula Check Sheets

SITE HAZARD RATING ESTIMATION FORMULA CHECK SHEET

Site No: *ONE* **Location:** *Boonah - Rathdowney Road*

Site Hazard Rating = A x B x C

Site Condition Factor (A)	89
X	
Site Complexity Factor (B)	5.5
x	
Traffic Effects Factor (C)	5
Total - SHR	2448

Traffic Effects Factor (C)

Site Location	Factor
Works Not In Carriageway	1
Works on Shoulder	3
Traffic Moved into temporary Lanes	5
Traffic Merged into Reduced Number of Lanes	7
Traffic passing Site in Single Lane	10
Selected Value - Traffic Effects Factor (C)	5

Site Complexity Factor (B)

	Highest Approach Operating Speed				
ADT	50	60	70	80	100
0-500	1	2	3	4	5
501-1000	2	3	4	5	6
1001-5000	3	4	5	6	7
5001-10000	4	5	6	7	8
10000+	5	6	7	8	10

Selected Value		3
Intersection Factor		
No Intersections affected enter 1		
Intersection's affected enter 1.5		
Selected Value	X	1.5
Result	=	4.5

Footpath users affected by works

Not Affected	50	60	70	80	100
0	+1	+2	+3	+4	+5

Selected Value	+	1
Site Complexity Factor (B)	=	5.5

Site Condition Factor (A)

Signs	Points	Tally Box	Total
Omitted - on main route	5 for each sign omitted	6	30
Omitted - on side road	2 for each sign omitted	12	24
Used unnecessarily	1 for each sign used unnecessarily		
Spacing too close	2 for each sign spaced too close		
Not Visible	2 for each sign not visible		
Condition Marginal	1 for each sign in marginal condition		
Condition Unacceptable	2 for each sign in unacceptable condition		
Order incorrect	2 for each sign out of order	1	2
Permanent Signs Not Covered	2 for each sign not covered		
Non Gazetted Signs Used	3 for each sign used	1	3
Sign on not on LHS but on RHS	1 for each sign so installed		
Sign too Low/Small	1 for each sign so installed		
Signs not Visible at Night	2 for each sign not visible at night		
Speed Restriction not Appropriate	5 for each deviation from appropriate limit	1	5
		Subtotal	64

Channelling Systems	Points	Tally Box	Total
Not Used	20 points		
Tapers too short	10 for each taper	1	10
Spacing inadequate in tapers	5 for each taper		
Spacing inadequate in lanes	5 for every 100 metres this exists		
Condition Marginal	1 for each device in marginal condition		
Condition Unacceptable	2 for each device not acceptable		
Device too small	1 for each device too small		
44 Gallon Drums	2 for each drum in use		
Using non approved device	1 for each device in use		
		Subtotal	10

Miscellaneous	Points	Tally Box	Total
Pedestrians Forced into Live Lane	5 for each affected footpath		
Pedestrians Forced into Work Area	5 for each affected footpath	1	5
Road Surface Condition Rough	5 for every 100 metres		
Safety Zones Compromised	5 for each occasion		
Working in Live Lanes Hazardously	10 for each occasion		
Flashing Lights not Used/Ineffective	1 for each vehicle		
High Visibility Jackets not Worn	5 for each individual	2	10
High Visibility Jackets not Visible	3 for each individual		
Site Length Excessive	5 for every 500 metres over 1 km		
		Subtotal	15
		TOTAL SCF - (A)	89

APPENDIX C

RCA Response to Draft Audit Report

APPENDIX D
Health and Safety Plan for Safety Audit

Appendix D : Health and Safety Plan for Safety Audit of Traffic Control at Roadworks Sites

Team Leader to file with Client when completed, and before site inspections.

Road Controlling Authority: Boonah District Council

Date: 8/9/98

Audit Team	Name	Confirmation of H&S Briefing
Team Leader	T. Leader	
Team Member No. 1	S. Member	
Team Member No. 2	A. Manager	
Client Representative	A. Person	

TEAM LEADER'S BRIEFING TOPICS

Safety Hazards Summary

- Inspection vehicle: Road crash risks, use in terms of mobile operations
- Team member (pedestrian): Pedestrian vs vehicles risks.
- Team member health hazards: sun, rain, cold etc

Preventative Measures

Vehicle;

- Comply at all times with the road rules (Reg, WOF, licensed driver).
- Drive defensively
- Ensure the driver is not required to undertake tasks which would cause distraction from driving task

Team Members must:

- Always wear high visibility safety clothing when outside of the vehicle.
- Comply with TNZ's HCH, GI and Working on the Road requirements, as appropriate.
- Ensure that another team member 'watches the backs' for members undertaking detailed on carriageway inspections.
- Ensure they have suitable clothing (coat, hat, etc) and use them when appropriate.
- In the event of a crash either involving or witnessed by the Team:
  - ➢ Provide immediate assistance where possible
  - ➢ Notify emergency services
  - ➢ When the Team is involved, affected members must notify their own organisations and follow their internal Health and Safety procedures.